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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/052,145	01/17/2002	Tomohiro Konuma	MAT-8220US	1041

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EXAMINER

HARPER, V PAUL

ART UNIT PAPER NUMBER

2654

DATE MAILED: 06/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/052,145	<b>Applicant(s)</b> KONUMA ET AL.	
	<b>Examiner</b> V. Paul Harper	<b>Art Unit</b> 2654	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 April 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3,5 and 7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,5, and 7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1, 3, 5, and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Schwartz et al. (U.S. Patent 5,241,619), hereinafter referred to as Schwartz.

Regarding **claim 1**, Schwartz discloses a speech recognition system that uses a word dependent N-best search method. Schwartz's method includes the following steps:

- a feature-amount extracting step for extracting a feature amount based on a frame of an input utterance (Fig. 1, items 8 and 9; col. 3, lines 40-43, where the features correspond to the characterizing vectors);
- a storing step for determining whether a current processing frame is within or at the end of a candidate word previously registered, and storing the candidate word on the basis of a first hypothesis-storage determining criterion when within a word (col. 3, lines 43-51, in the selected words scores are accumulated for each of the n most likely word theories with an inherent recording of the candidate word; different state theories within a word are maintained) and on the basis of a second hypothesis-storage

Art Unit: 2654

determining criterion when at the word end (col. 3, lines 51-54, at the end of each word, probabilities and identities are recorded);

- a developing step for developing a hypothesis, the hypothesis being at least one hypothetic candidate word, the hypothetic candidate word selected from candidate words previously registered, by extending utterance segments expressing the hypothetic candidate word when a stored candidate word is within a word and by joining a word to follow according to an inter-word connection rule when at the word end (col. 3, lines 50-59, each new word is begun with consideration given to the previous words and a grammar model; at the end of the utterance the word sequences are reassembled);

- an operating step of computing, in the frame a similarity measure between a frame feature amount extracted from the input utterance and a frame-based feature amount of an acoustic model of the developed hypothesis, and calculating a new recognition score from a) the similarity measure and b) a recognition score of the developed hypothesis of up to an immediately preceding frame calculated from the similarity measure (col. 3, lines 50-59; col. 5, lines 30-45, at each state within a word the probability is calculated; also col. 6, lines 26-33); and

- a step of repeating the storing step, the developing step and the operating step until the processing frame becomes a last frame of the input utterance and outputting, as a recognition result approximate to the input utterance, at least one of hypotheses in the order of higher recognition score due to processing the last frame (col.5, lines 40-45; when the utterance is completed, the word sequences with the highest probabilities are assembled with inherent storage),

- wherein the first hypothesis-storage determining criterion selects candidate words within a predetermined threshold from a maximum value of the recognition score, and (col. 6, lines 11-15, lines 26-31, beamwidth, i.e., a threshold; Fig. 4A, lines 36 and 38 and 46, only models [word candidates/theories] that exceed the threshold are maintained)
- the second hypothesis-storage determining criterion selects a subset of candidate words from among candidate words selected according to the first hypothesis-storage determining criterion, the subset of candidate words selected according to a predetermined number of upper ranking recognition scores (col. 6, lines 20-31, Fig. 4A, line 46 where n is the maximum number of word theories to keep for any state—including the final state).

Regarding **claim 3**, Schwartz discloses a speech recognition system that uses a word dependent N-best search method. Schwartz's system includes the following:

- a feature-amount extracting section for extracting a feature amount based on a frame of an input utterance (Fig. 1, items 8 and 9; col. 3, lines 40-43, where the features correspond to the characterizing vectors);
- a search control section for controlling to develop a hypothesis, the hypothesis being at least one hypothetical candidate word, the hypothetical candidate word selected from candidated words previously registered, by extending based on utterance segments to express the hypothetical candidate word when the hypothesis is within the word and by joining a word to follow according to an inter-word connection rule

Art Unit: 2654

previously determined when at a word end (Fig. 1, items 12, 14, and 16; col. 3, lines 50-59, each new word is begun with consideration given to the previous words and a grammar model; different state theories within a word are maintained; at the end of the utterance the word sequences are reassembled);

- a similarity computing section for computing, in a frame, a similarity measure between a frame feature amount extracted from the input utterance and the frame feature amount of an acoustic model of the developed hypothesis (col. 3, lines 40-59; col. 5, lines 30-45, at each state within a word the probability is calculated for selected Markov states; also col. 6, lines 26-33);

- a search operating section for operating a recognition score from the similarity measure and recognition score of the developed hypothesis of up to an immediately preceding frame (col. 3, lines 40-59; col. 5, lines 30-45, at each state within a word the probability is calculated; at the end of the utterance the word sequences having the highest scores are accumulated; also col. 6, lines 26-33);

- a hypothesis determining section for determining whether a current processing frame is within the word or at the word end of the hypothetical candidate word and using the recognition score to select the candidate word according to a first determining criterion when within the word (col. 3, lines 43-51, scores are accumulated for each of the n most likely word theories with an inherent recording of the candidate word) and to select the candidate word according to a second determining criterion when at the word end (col. 3, lines 51-54, at the end of each word, probabilities and identities are recorded);

Art Unit: 2654

- a hypothesis storing device for storing the hypothesis determined to be stored (col. 3, lines 50-59; word sequences are reassembled with inherent storage);
- a word hypothesis registering device for registering as a new hypothesis the hypothesis and the recognition score (col. 3, lines 50-59; word theories are created and since previous theories can be accessed they must have been previously stored); and
- a recognition result output section for continuing the frame-based process to a last frame of the input utterance and outputting at least one hypothesis in the order of higher recognition score (col. 3, lines 50-59; at the end of the utterance word sequences with the highest accumulated scores are reassembled; Fig. 1, **MOST LIKELY SENTENCE AND INTERPRETATION**).
- Wherein the first determining criterion selects candidate words within a predetermined threshold from a maximum value of the recognition score (col. 6, lines 11-15, lines 26-31, beamwidth, i.e., a threshold; Fig. 4A, lines 36 and 38 and 46, only models [word candidates/theories] that exceed the threshold are maintained), and
- The second hypothesis-storage determining criterion selects a subset of candidate words from among candidate words selected according to the first hypothesis-storage determining criterion, the subset of candidate words selected according to a predetermined number of upper recognition scores (col. 6, lines 20-31, Fig. 4A, line 46 where n is the maximum number of word theories to keep for any state—including the final state).

Regarding **claim 5**, this claim is a program version of the method claim 1. Furthermore, claim 5 has limitations similar to claim 1 and is rejected for the same reasons.

Regarding **claim 7**, this claim is a computer-readable recording medium for recording a program that executes a method with limitations similar to those in claim 1 and is rejected for the same reasons.

### ***Response to Arguments***

2. Applicant's arguments filed 4/06/2005 have been fully considered but they are not persuasive.

3. Applicants assert on page 10:

Schwartz et al. disclose a speech recognition system that performs an N-Best search. An utterance is divided into frames and for each frame, word theory probability scores are computed to generate a combined probability of a partial sentence hypothesis (col. 3, lines 43-45) beginning with the utterance and ending with the current state of the current frame (col. 10, lines 7-8). Schwartz et al. thus determine and store candidate words in memory at each node of a grammar. Schwartz et al. do not disclose nor suggest the features of applicants amended claim 1, namely: storing the candidate word 1) "on the basis of a first hypothesis storage determining criterion when within the word ...selects candidate words within a predetermined threshold from a maximum value of the recognition score." and 2) "on the basis of a second hypothesis-storage determining criterion when at the word end ... selects a subset of candidate words from among candidate words selected according to the first hypothesis-storage determining criterion, the subset of candidate words selected according to a predetermined number of upper ranking recognition scores" (emphasis added).



Addressing 1), above, Schwartz et al. teach the use of a threshold (beamwidth) at any point in the frame including the final state (co. 6, lines 26-33), which corresponds to selecting candidate words within a predetermined threshold.... With 2), above, Schwartz et al. teach that at the final state of each word alternative word choices are saved (n most likely) and used to generate the N most likely sequences of words (col. 3, lines 47-51; col. 6, lines 20-25), which corresponds to when at the word end ... select a subset of candidate words from among candidate words selected according to the first hypothesis determining criterion....”

4. Applicants further assert on page 10:

Applicants' amended claim 1 further represents an advantage over Schwartz et al. Because Schwartz et al. determine and store candidate words at each node, the computational load and memory quantity will increase in proportion to increasing the nodes. In Applicants amended claim 1, at a word end, a subset of candidate words are selected and stored from among candidate words selected according to the first hypothesis-storage determining criterion. Therefore, the computational load and memory quantity will be reduced with applicants' amended claim 1 as compared with Schwartz et al. Thus, applicants amended claim 1 represents an advantage and is patentable over the art of record. Accordingly, allowance of claim 1 is respectfully requested.

As stated above, a threshold (beamwidth) is used at any state within the frame (first hypothesis-storage determining criterion) (col. 6, lines 26-33) and that at the end of each word a separate score is accumulated for the n most likely previous word theories (col. 3, lines 45-53).

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to V. Paul Harper whose telephone number is (571) 272-7605. The examiner can normally be reached on M-F.

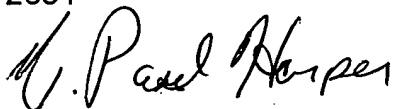
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (571) 272-7602. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2654

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

06/13/2005

V. Paul Harper  
Patent Examiner  
Art Unit 2654



**VIJAY CHAVAN**  
**PRIMARY EXAMINER**